Mr. Coville recognizes that the hypothesis of transformation of starch into sugar by the weakening of cell membrane and the consequent leakage of starch-transforming enzyms into the starch chambers may very properly be challenged. In the Tropics there is no chilling weather, yet some trees and shrubs alternate from a state of dormancy to active growth, much as in cold climates. As a probable explanation of this, Mr. Coville points out that injury, such as pruning or girdling, to a long-dormant plant will often start it into growth, possibly caused by enzym being brought into contact with the starch as a direct result of the breaking and straining of the cells. Sugar is then formed and growth begins. This phase of the question is discussed in considerable detail, with the conclusion that the awakening from dormancy to growth in tropical plants may result from cell injury caused by the long dormant period.

The twigs of trees and shrubs, after their winter chilling and the transformation of their starch into sugar, are regarded as mechanisms for the development of higher osmotic pressures which start the plant into growth. Finally, the importance of the establishment of a dormant condition before the advent of freezing weather, and the continuation of this dormancy through warm periods in late fall and early winter, as a protective adaptation to the native trees and shrubs, is pointed out. If plants were so constituted as to start into growth as readily in the warm periods of late fall as they do during similar periods in early spring, the result might frequently be disastrous.—*J. B. K.*

RELATION OF WEATHER TO FRUITFULNESS IN THE PLUM.

By M. J. DORSEY.

[Review-summary of paper No. 162, Journal Series, Minnesota Agricultural Experiment Station.[1]]

Owing to the fact that fruit buds usually appear in the plum in sufficient abundance to produce a full crop of fruit with favorable development, and the further fact that the intervening period between the beginning of blossoming and the setting of fruit is of short duration, the question can be approached with confidence of success in an attempt to isolate definitely the weather factors influencing the setting of fruit.

The study is based on meterological and fruiting data collected during a period of 7 years, 1912 to 1918, inclusive. The data are presented in graphic form by means of diagrams showing the influence of wind, temperature, sunshine, and rainfall during the blooming period on the setting of fruit, and are presented for each blooming period and for 10 days thereafter.

In some experiments cited, it was found that no fruit set from wind-carried pollen when insects were excluded. Therefore, wind may be regarded as having a more indirect than direct bearing on the setting of fruit, in that its influence upon bee flight may be serious at certain times, bees being the chief polinizer of the plum.

Temperature is considered of primary importance from three standpoints: Its effect upon pollen or pistil, its influence upon pollen-tube growth, and its interference with bee flight. In some experiments pollen was not destroyed by exposure to freezing temperature. With an exposure to a temperature of 29.3° F., 56 per cent of plum pollen germinated, compared with 62 per cent when exposed to temperatures above freezing. On the other hand, 21 plum pistils exposed to similar low temperatures for six hours were all killed, except two. Also the time required for germination was considerably increased as a result of low temperature. The action of low temperature in retarding pollen-tube growth is considered as one of the principal causes of the failure of fruit to set, as it was shown that plum pollen does not germinate at temperatures below 40° F. and even at 51° F. there is slow pollen-tube growth. It is pointed out that individual bees can control muscular movement only with temperatures 45° F. or higher, and that, in general, they will not leave the hive when the temperature is below 60° F.

Investigations were cited to show that while sunshine has a direct influence on the fertilization of the tomato, it apparently has none on the plum. Judging from these experiments, sunshine appears to have the chief bearing in this connection on such factors as insect flight and general plant activity, particularly nectar secretion.

On account of the nature of the processes taking place at blooming time, rainfall was found to have a more direct effect than any of the other weather elements. The fact that the period of pollination in the plum is so limited makes it possible for rain to delay normal functioning to an injurious extent. A study of the bloom in the orchard during a heavy and prolonged rain showed that the stamens were drawn together and held in a cluster about the pistil by a large drop of water, especially in the absence of wind. In order to study another action more in detail at the time of rain, a limb which had been in bloom for three days was cut from the tree during a heavy rain and brought into the laboratory, the temperature of which was about 68° F. All anthers were closed when first brought in, but some opened completely in 10 minutes, but when again placed in water they closed in two or three minutes.

The conditions which close anthers frequently prevent insect flight, but even if insects were working, pollination could not take place for the reason that pollen is not available. It appears, therefore, that too much emphasis has been placed upon the action of rain in washing the pollen away, because anthers largely close quickly enough to prevent it. In addition to the above, the effect of water on other organs of the plum flower and their functioning process is discussed in considerable detail.

In summarizing, it is pointed out that unfavorable weather at blooming time may completely prevent the setting of fruit, even though there be a full bloom, and that rain and low temperatures are the most important factors, although strong wind when prolonged is harmful. Wind has its influence indirectly by interfering with insect action, but is seldom strong enough to cause direct mechanical injury. Frosts during bloom injure the pistil more than the pollen, but the greatest damage from low temperature is in the retarding of pollen-tube growth. Cloudiness has no injurious effect in the setting of fruit, but rain prevents pollen dissemination by closing the anthers or preventing them from opening. In one season, rain during bloom may be the limiting factor and in another low temperatures during the period of tube growth.—*J. B. K.*

[1] Shorter abstract published in MONTHLY WEATHER REVIEW, May, 1920, 48: 285.